
Periodontal condition, hygiene behaviour and attitudes to oral health

**Children's Dental Health in the United
Kingdom, 2003**

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October 2004

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The 2003 Children's Dental Health Survey

The 2003 Children's Dental Health Survey, commissioned by the four United Kingdom Health Departments, is the fourth in a series of national children's dental health surveys that have been carried out every 10 years since 1973 in England and Wales and in the whole of the UK since 1983.

The survey provides information on the dental health of children in the United Kingdom, measures changes in oral health since the last survey in 1993 and provides information on children's experiences of dental care and treatment and their oral hygiene.

The 2003 survey was based upon a representative sample of children aged 5, 8, 12 and 15 years of age attending government maintained and independent schools in the UK. A total of 12,698 children were sampled within participating schools and asked to take part in a dental examination at school. In total 10,381 children were examined, a response rate of 82%. Background data on children's oral hygiene and dental care and were requested by questionnaire from the parents of a random sub-sample of 5,480 examined children. In total, 3,342 questionnaires were returned, a response rate of 61%.

Details of the survey methodology can be found in the Children's Dental Health in the United Kingdom 2003 Technical Report available at <http://www.statistics.gov.uk/children/dentalhealth/>

Acknowledgements

Children's Dental Health Survey and the production of this report. In particular colleagues from the Dental Schools of the Universities of Birmingham, Dundee, Newcastle and Wales, the Dental Health Services Research Unit, Dundee and the Central Survey Unit of the Northern Ireland Statistics and Research Agency, the dentists and dental nurses who carried out the examinations (a list of dentists and dental nurses can be found in the Technical Report).

The examinations took place in schools. Local Education Authorities, headteachers and school staff gave their help and cooperation in the administration of the study. Most importantly, thanks go to the children who were examined, and the parents who completed questionnaires about their children's dental background.

Particular acknowledgement goes to Jan Gregory (1946–2003) for her considerable contribution to the series of adult and children's dental health surveys, as well as a wide range of other ONS surveys.

Notes on the tables and text

Proportionately larger samples were selected in Wales and Northern Ireland than in England to provide estimates for these three countries within the UK. The data needed to be reweighted in order to produce representative figures for the UK as a whole. Weighted bases are provided for UK estimates and unweighted sample sizes are provided for individual country comparisons.

There was no oversampling in Scotland relative to England as a separate analysis for Scotland was not required by the Scottish Executive.

Differences cited in the text are statistically significant ($p < 0.05$) unless otherwise stated.

A dash in a table indicates a zero value, while an asterisk indicates a proportion of less than 0.5% or a mean of less than 0.05.

Figures presented in parentheses [] indicate a low base number of respondents and results are indicative only.

Summary

This report presents information on periodontal health and oral cleanliness, as well as reported oral hygiene behaviours and parental attitudes towards oral health.

Since 1993, the proportion of children with plaque has risen in five-, eight-, 12- and 15-year-olds. For example 63% of 15-year-olds had some plaque in 2003 compared to 57% a decade earlier. Between 1993 and 2003 an increase in the proportion of children affected by gingivitis was observed among five-, eight- and 12-year-olds. The proportion of children with some calculus increased among eight-, 12- and 15-year-olds.

Among 15-year-olds, boys were more likely than girls to have some plaque and gingivitis. Sixty-eight per cent of 15-year-old boys had some plaque compared to 57% of 15-year-old girls, while 56% of 15 year old boys had some gingivitis compared to 48% of girls.

There was some evidence for variations in plaque, gingivitis and calculus according to social variables. For example, eight-year-olds from 'deprived' schools (based on free school meals uptake) were more likely to have visible plaque deposits (78% affected) than those from less deprived schools (70%).

Three-quarters of children in all age groups report brushing their teeth twice daily. Electric toothbrushes are commonly used and adjuncts such as mouthwashes and dental or sugar free chewing gum are used by almost half of 15-year-olds. In general, children who brush their teeth more frequently are more likely to have good periodontal health.

Parental attitudes towards restoration of children's permanent teeth show that a majority would prefer decayed permanent teeth to be filled: 96% would prefer this option for front teeth and 89% for back teeth. However, this is not the case for baby teeth where parents were more likely to prefer an extraction (39%) or to leave the tooth alone (27%) rather than filling it.

Introduction

Indicators of oral health include the condition of children's gums as well as their teeth. This report examines the periodontal health of children, using information from the oral examination.

In addition, reported oral hygiene behaviours and parental attitudes form an important part of understanding the whole picture of oral health. This report also presents information from the questionnaire to determine these aspects of children's oral health.

The oral examination included four measures of periodontal health that had been used in the previous surveys of 1983 and 1993. Three of these, relating to the visual examination of the gingivae, recorded the presence of gum inflammation, plaque and calculus for each of the six segments of the mouth, for all age groups. The criteria were consistent with those used in 1993. The fourth measure of periodontal health was used for 15-year-olds only. This made use of a periodontal probe which was used to detect gingival bleeding, a marker of active periodontal disease, around six index teeth. Periodontal pocketing was not measured, as accurate assessment of periodontal attachment loss at this age is difficult without a much more detailed and invasive examination. Furthermore, previous surveys had not identified periodontal attachment loss as a significant public health problem this age.

The report looks at factors in children's background that might contribute to different levels of gum health and oral cleanliness.

The visual assessment of the gums

Each of the six segments of the mouth were examined for the presence or absence of gum inflammation, plaque and calculus.

Table 1 shows that overall, in 2003, the proportion of children in three of the four age groups with some gum inflammation had risen since the previous survey in 1993. The exception was for 15-year-olds, where levels had remained the same. This continued the trend demonstrated between 1983 and 1993, albeit with smaller rises. Only a third (32%) of 5-year-olds had some inflammation, but by the age of 8, this had almost doubled to 63%. Among 12-year-olds, a similar proportion (65%) were affected. However, this had reduced to 52% of 15-year-olds.

Table 1

Table 1 Proportion of children with unhealthy gums plaque and calculus by age (United Kingdom, 1983, 1993, 2003)

Age	Gum inflammation			Plaque			Calculus		
	1983	1993	2003	1983	1993	2003	1983	1993	2003
	Percentage of children:								
5	19	26	32	29	45	50	3	5	
8	46	58	63	55	70	76	13	16	
12	49	60	65	48	68	73	21	20	
15	48	52	52	47	57	63	33	32	

In 5-, 8- and 12-year-olds, boys and girls showed similar proportions of children with inflamed gums. However, among 15-year-olds, a higher proportion of boys (56%) showed some inflammation than girls (48%).

Schools involved in the survey were classified as either 'deprived' or 'non-deprived' based on the proportion of children receiving free school meals. In 8-year-olds, a lower proportion of children in deprived schools (54%) had inflamed gums than those from non-deprived schools (65%).

Generally, children in Wales were less likely than those in England and Northern Ireland to have gum inflammation. For example, 25% of 5-year-olds in Wales had some gum inflammation compared with 32% in England and 36% in Northern Ireland. In 15-year-olds however, England had the lowest proportion (52%) of children with inflamed gums compared with Wales (56%) and Northern Ireland (65%).

Table 2

Table 2 Proportion of children with unhealthy gums (in any sextant) by age (United Kingdom, 2003)

	Age			
	5	8	12	15
	Percentage of children with some gum inflammation:			
All	32	63	65	52
Sex				
Boys	33	65	68	56
Girls	31	62	63	48
School level of deprivation				
Non-deprived	33	65	67	52
Deprived	28	54	54	52
Country				
England	32	65	53	67
Wales	25	52	61	56
Northern Ireland	36	63	68	65

Plaque showed a similar pattern to that of inflammation; there was an increase of about five percentage points in the proportion of children with some plaque in all age groups since 1993. Again, higher proportions of children aged 8 (76%) and 12 (73%) had plaque than their counterparts aged 5 (50%) and 15 (63%).

Table 1

Fifteen-year-old boys were more likely to have plaque present than girls. Sixty-eight per cent of 15-year-old boys had plaque compared with 57% of girls. Among children aged 8, a higher proportion of children in deprived schools had plaque than those in schools classified as non-deprived. There were no further statistically significant differences due to sex or school deprivation status.

Table 2

Wales had the lowest proportion of children with plaque in all age groups except 12-year-olds, where the difference was not statistically significant. For example, 44% of 5-year-olds in Wales had some plaque compared with 50% in England and 56% in Northern Ireland.

Table 3

Table 3 Proportion of children with plaque (in any sextant) by age (United Kingdom, 2003)

	Age			
	5	8	12	15
Percentage of children with some plaque:				
All	50	76	73	63
Sex				
Boys	52	78	76	68
Girls	48	75	70	57
School deprivation status				
Non-deprived	51	70	76	59
Deprived	50	78	73	64
Country				
England	50	78	74	63
Wales	44	71	72	63
Northern Ireland	56	75	77	77

Table 1 also showed that levels of calculus had risen in all age groups except 5-year-olds compared with previous surveys. As in 1993, increasing proportions of children were affected as their age increased: only a small proportion (6%) of 5-year-olds had calculus compared with 23% of 8-year-olds, 30% of 12-year-olds and 39% of 15-year-olds.

Table 1

There were no statistically significant differences in the proportion of children with calculus according to sex or school deprivation status. Among all age groups, the proportion of children with calculus in Wales was lower than in England. The difference was most pronounced among 8-year-olds, where there was an 11 percentage point difference between the two countries: 14% of 8-year-olds in Wales had calculus compared with 25% in England.

Table 4

Periodontal condition, hygiene behaviour and attitudes to oral health**Table 4** Proportion of children with calculus (in any sextant) by age (United Kingdom, 2003)

	Age			
	5	8	12	15
	Percentage of children with some calculus:			
All	6	23	30	39
Sex				
Boys	6	26	32	41
Girls	6	21	28	37
School deprivation status				
Deprived	5	17	33	36
Non-deprived	6	25	30	40
Country				
England	6	25	32	41
Wales	2	14	24	32
Northern Ireland	4	19	27	35

Gingivitis among 15-year-olds

In 15-year-olds, an assessment of gingival bleeding was made by applying a periodontal probe around six index teeth. Gingival bleeding, is a marker of active periodontal disease. Table 5 shows that 43% of 15-year-olds had gingivitis, similar to that found 1993 (45%) and a decrease from 48% in 1983. A larger proportion of 15-year-olds in England (45%) had gingivitis than in Wales (37%).

*Table 5***Table 5** Proportion of 15-year-old children with gingivitis by country (United Kingdom, 1983, 1993, 2003)

	Country		
	1983	1993	2003
England	47	44	45
Wales	41	62	37
Northern Ireland	60	39	44
United Kingdom	48	45	43

Application of a periodontal probe revealed that a lower proportion (39%) of 15-year-old boys than girls (46%) had gingivitis, despite the fact that visual examination had demonstrated an opposite finding. There were no differences between children from deprived and non-deprived schools.

Table 6

Table 6 Proportion of 15-year-old children with gingivitis by gender (United Kingdom, 2003)

	Boys	Girls	All
	39	46	43
<i>Weighted base</i>	<i>1097</i>	<i>1045</i>	<i>2142</i>

Tables 5 and 6 showed the proportion of children with some gingivitis. However, different segments of the mouth are affected with varying frequencies. Table 7 demonstrates that almost a quarter of 15-year-olds had gingivitis around their lower right six (23%) and lower left six (21%) compared with a smaller proportion (15%) who had gingivitis around their upper molars. The incisor teeth were affected in the smallest proportion of children (13%). There had been a small reduction for all teeth since 1993.

Table 7

Table 7 Presence of gingivitis among 15-year-old children by tooth (United Kingdom, 1993, 2003)

	Upper right 6	Upper right 1	Lower right 6	Upper left 6	Lower left 1	Lower left 6	Any tooth
	Percentage of 15-year-olds with:						
Some gingivitis							
2003	15	13	23	15	13	21	43
1993	19	14	24	18	16	24	45

The relationship between gingivitis and dental decay is shown in Table 8. The proportion of 15-year-olds with gingivitis who had some decay into dentine (40%) was higher than for those children with healthy gums (26%). A similar pattern existed with obvious decay experience; 63% of children with gingivitis had some experience of dental decay compared with 53% of those who had healthy gums.

Table 8

Table 8 Proportion of 15-year-old children with gingivitis, decay into dentine and obvious decay experience (United Kingdom, 2003)

	Condition	
	Gingivitis	Healthy Gums
	Percentage of 15-year-olds:	
Decay into dentine (D3cv)	40	26
Obvious decay experience (D3cvMFT)	63	53
<i>Weighted base</i>	<i>897</i>	<i>1245</i>

Oral healthcare at home

Information from the questionnaire gives an indication of the way that children's teeth and oral health are maintained at home. As in previous surveys, questions were asked about tooth brushing and the use of fluoride supplements. In addition, the use of other oral health aids was investigated.

Overall, more than three quarters of children in all age groups in 2003 reported brushing their teeth at least twice a day. However, there were differences between boys and girls, with girls in all age groups more likely to brush more frequently than boys. For example, in 5-year-olds, 78% of girls brushed twice a day compared with 74% of boys and among the 15-year-olds, 79% of girls aged brushed twice a day compared with 70% of boys.

Table 9

Additionally, there were social class differences in reported brushing frequency with children from non-manual households being more likely to brush their teeth at least twice a day than those from Social Classes IV and V. This was most marked in the youngest and oldest age groups. For example, 78% of 5-year-olds from high social class groups brushed twice a day compared with 60% of their counterparts from low social class groups.

The pattern was the same for 15-year-olds where 79% from Social Classes I, II, III_{nm} brushed twice a day compared with 66% of this age group from Social Classes IV and V.

Table 9

Table 10 shows the trend in reported brushing frequency since previous surveys. In all age groups there had been an increase since 1993 in the proportion of children brushing twice daily, bringing all age groups to a similar level. This reflected the trend shown between 1983 and 1993, albeit with smaller increases. For example, in the 15-year-olds, three-quarters brushed twice daily in 2003, compared with 67% in 1993 and 46% in 1983. Seventy-six per cent of 5-year-olds brushed twice daily in 2003, compared with 74% in 1993 and 53% in 1983.

Table 10, Figure 1

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There had been a corresponding decrease, most marked in the oldest children, in the proportion of children in all age groups reporting that they brushed three or more times daily and for 8- and 12-year-olds who brushed only once a day or less.

Table 10

Table 9 Frequency of tooth brushing by age, gender and social class (United Kingdom, 2003)

	Age			
	5	8	12	15
	Percentage of children:			
All				
Three times or more daily	2	1	4	6
Twice daily	76	77	72	75
Once daily or less	21	22	24	19
<i>Weighted base</i>	960	929	802	638
Boys				
Three times or more daily	2	1	2	5
Twice daily	74	73	70	70
Once daily or less	24	26	28	24
<i>Weighted base</i>	460	444	430	329
Girls				
Three times or more daily	3	1	7	7
Twice daily	78	80	75	79
Once daily or less	19	18	19	14
<i>Weighted base</i>	500	485	372	309
Social Class I, II, III non-manual				
Three times or more daily	3	1	4	5
Twice daily	78	81	75	79
Once daily or less	18	19	22	16
<i>Weighted base</i>	551	501	479	375
Social Class III manual				
Three times or more daily	*	2	4	6
Twice daily	83	70	68	70
Once daily or less	16	28	28	24
<i>Weighted base</i>	177	191	174	130
Social Class IV,V				
Three times or more daily	2	1	1	6
Twice daily	60	74	71	66
Once daily or less	38	25	28	28
<i>Weighted base</i>	133	142	92	78

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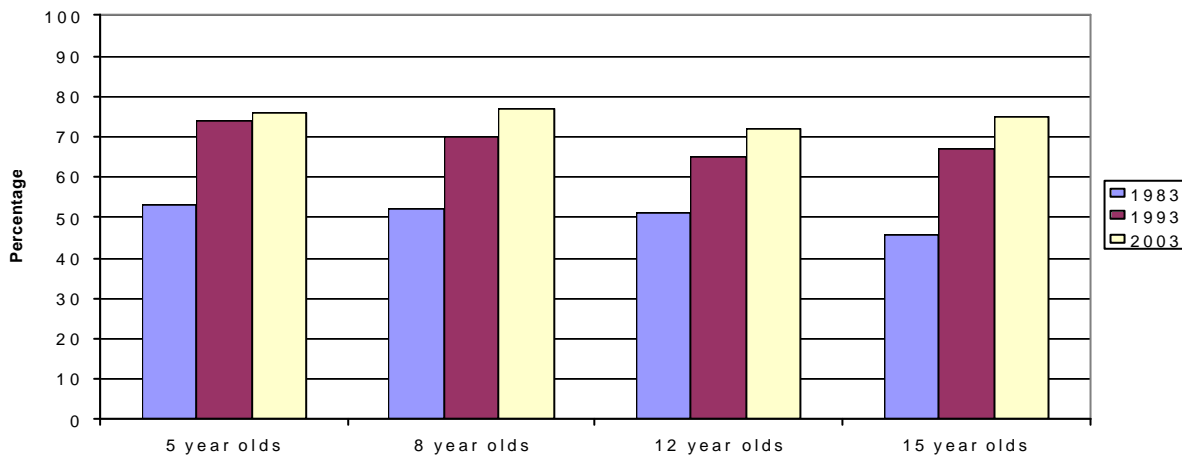
Recommended professional advice is that young children (up to the age of 7) need help with tooth brushing¹ as they do not have the manual dexterity to carry it out effectively themselves. Parents of children aged 5 and 8 were asked whether they helped with tooth brushing or whether their child did it alone. Table 11 shows that half of 5- year- old children brushed alone and half had help from parents. Unsurprisingly, a much higher proportion (84%) of children aged 8 brushed their teeth alone.

Table 11

Table 10 Comparison of brushing frequency by year of survey (United Kingdom, 1983, 1993, 2003)

Age	5			8			12			15		
	1983	1993	2003	1983	1993	2003	1983	1993	2003	1983	1993	2003
	Percentage of children:											
Three or more times daily	4	4	2	4	5	1	4	7	4	12	13	6
Twice daily	53	74	76	52	70	77	51	65	72	46	67	75
Once a day or less	42	21	21	40	25	22	44	28	24	38	20	19
Never	1	-	-	3	-	-	1	-	-	3	-	-

Figure 1 Proportion of children brushing teeth twice daily by age (United Kingdom, 1983, 1993, 2003)



The use of different oral hygiene products is shown in Table 12. As might be expected, toothbrushes and toothpaste are used widely. About four-fifths of

¹ Levine R S and Stillman-Lowe C R (2004) *The Scientific Basis of Oral Health Education*, British Dental Association: London.

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children in all age groups use an ordinary toothbrush, but electric or battery operated brushes are becoming popular, particularly among eight-year-olds where 65% reported using them, compared with 52% of 12-year-olds and 48% of 15-year-olds.

Table 11 Who brushes childrens teeth by age and social class (United Kingdom, 2003)

Age	5				8			
	I,II,III non manual	III manual	IV,V	All	I,II,III non manual	III manual	IV,V	All
	Percentage of children:							
Child	46	57	52	50	86	86	84	84
Parent or parent with child	54	43	48	50	14	14	16	15
Don't Know	*	-	-	*	*	-	-	1
Never brushes teeth	-	-	-	-	-	-	-	-
<i>Weighted base</i>	553	177	133	963	505	191	142	934

Other products that are commonly used at home are mouthwashes and sugar free or dental chewing gum and the use of these increases with age. Around a quarter (23%) of 8-year-olds use mouthwash compared with just over a third (38%) of 12-year-olds and 46% of 15-year-olds. A similar pattern exists for chewing gum. Dental floss is appropriate for older children to use as an adjunct to tooth brushing. Eighteen per cent of 15-year-olds and 13% of 12-year-olds reported using dental floss as did smaller proportions of 8- and 5-year-olds. Some children of all ages made use of dental disclosing tablets.

Table 12

Table 12 Proportion of children in each age group using different oral hygiene products (United Kingdom, 2003)

	Age			
	5	8	12	15
	Percentage of children:			
Toothbrush (non-electric)	84	80	84	83
Electric / battery operated toothbrush	53	65	52	48
Toothpaste	96	95	96	97
Fluoride drops or tablets	2	1	2	1
Mouthwash	8	23	38	46
Dental Floss	2	6	13	18
Dental disclosing (plaque revealing) tablets	2	6	10	5
Sugar free or dental chewing gum	13	24	34	44
Other	*	1	2	1
None of these	*	*	*	*
<i>Weighted base</i>	960	930	801	640

Fluoride supplements (tablets and drops) can be used in areas where there is no water fluoridation. As Table 13 shows, the proportion of children using these supplements is very small and has decreased since the previous survey. In Northern Ireland where they were

more commonly used in 1993, there has been a dramatic reduction in all age groups. Only 6% of 5-year-olds use fluoride supplements, compared with a third, ten years ago.

Table 13

Table 13 Use of fluoride supplements by age and country (United Kingdom, 1983, 1993, 2003)

Age	5		8		12		15	
	1993	2003	1993	2003	1993	2003	1993	2003
England	6	2	4	1	2	2	3	1
Wales	10	2	6	4	4	1	3	-
Northern Ireland	33	6	22	3	22	3	10	2
United Kingdom	9	2	6	1	3	2	3	1

Parental views about the causes and prevention of decay

Parents were asked, as in previous surveys, for their views on the causes and prevention of decay. The questions they were asked were *'What do you think makes teeth decay (or go bad)?'* and *'What do you think can be done to stop teeth decaying (or going bad)?'*. No prompts were given and responses were categorised into themes.

As in the previous surveys, the majority of parents believed that either the consumption of sweet and sugary foods or poor oral hygiene were the major causes of tooth decay. A larger proportion (82%) of parents of 5-year-olds believed sugar was a cause of decay compared with 73% of parents of 15-year-olds.

Table 14

Parental views about how to prevent decay had changed little since 1993, except that visiting the dentist was regarded by parents of children from all age groups as less likely to be a factor. Only 16% of 5-year-olds' parents and 22% of 15-year-olds' parents believed this could prevent decay compared with 25% and 29% in 1993.

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Table 14 What parents believe causes tooth decay (United Kingdom, 2003)

Age	5		8		12		15	
	1993	2003	1993	2003	1993	2003	1993	2003
	Percentage of parents:							
Sugar, sweet things	84	82	84	81	80	81	77	73
Poor oral hygiene	66	66	67	65	70	65	72	67
Scientific explanation!	n/a	6	n/a	8	n/a	6	n/a	8
Poor diet/nutrition	15	12	14	13	15	16	18	18
Not going to the dentist	3	2	3	2	4	4	6	6
Type of teeth	4	5	3	5	3	4	3	5
Lack of fluoride	1	1	1	1	1	1	-	*
Other specified answer	3	4	3	3	3	5	3	4

n/a Scientific explanation was not coded as a distinct category in 1993.

There had been a slight increase in the proportion of parents of 12- and 15-year-olds who believed that avoiding sweets and sugary food would prevent decay, bringing them more into line with parents of younger children. Fifty-five per cent of 12-year-olds' parents in 2003 thought that avoiding sweet things would prevent decay compared with 47% in 1993. Interestingly, a small proportion of parents of all children mentioned the use of sugar free chewing gum, which had not been regarded as a factor ten years ago.

Table 15

Table 15 What prevents decay by age and year (United Kingdom, 2003)

Age	5		8		12		15	
	1993	2003	1993	2003	1993	2003	1993	2003
	Percentage of parents:							
Avoid sweets/food	59	58	56	56	47	55	42	
Good oral hygiene	81	80	80	78	81	80	83	
Sugarfree/dental gum	n/a	1	n/a	1	n/a	3	n/a	
Good diet / nutrition	26	23	26	25	27	27	28	
Visit dentist regularly	25	16	24	17	27	18	29	
Preventative treatment	3	*	4	1	4	2	4	
Fluoride toothpaste/supplements	5	2	3	2	4	2	5	
Fluoride in water	1	2	2	1	2	1	1	
Fluoride, unspecified	2	1	2	1	1	1	2	
Dental Education	3	4	3	3	3	3	4	
Other	*	1	1	3	2	3	1	

n/a Sugarfree/dental gum was not coded as a distinct category in 1993.

Parental preferences for treatment of their children's teeth

Once teeth become decayed, treatment options are extractions or fillings. To maintain long-term oral health, restoration of teeth is preferable to extractions. Parents were asked what their treatment preferences were for decayed permanent teeth, both at the front and back of their child's mouth.

Table 16 shows that almost all of the parents would prefer a front tooth to be filled, ranging from 96% to 98% of the parents across age groups. This continues the trend shown in 1993 of an increasing proportion of parents preferring restoration. This trend is mirrored for the treatment of back teeth, although slightly fewer parents want this option compared with a front tooth. For example, 90% of parents of 8-year-olds would prefer a back tooth to be filled compared with 98% preferring this option for a front tooth. There is little social class variation in treatment preferences for front teeth. However, where treatment of a back tooth is concerned, a higher proportion of parents from Social Classes I, II, III prefer a filling than those from Social Classes IV and V.

Table 16

Table 16 Trends in proportion of parents preferring filling of permanent front and permanent back tooth by social class and year of survey (1983, 1993, 2003)

Age	5			8			12			15		
	1983	1993	2003	1983	1993	2003	1983	1993	2003	1983	1993	2003
Percentage of parents who would prefer the tooth to be filled:												
Permanent front tooth												
I,II,III non-manual	94	97	97	92	97	98	93	97	97	92	97	96
III manual	93	98	93	87	95	96	85	94	96	84	97	97
IV,V	88	95	97	81	92	99	76	95	97	81	93	95
All households	92	93	96	87	93	98	86	94	97	87	94	96
Permanent back tooth												
I,II,III non-manual	95	95	93	92	94	94	93	96	92	92	94	92
III manual	85	87	86	87	91	85	85	91	85	84	89	90
IV,V	78	84	79	81	86	88	76	81	85	81	81	87
All households	88	86	88	87	88	90	86	89	89	87	88	89

Although, in the long term, baby teeth will be shed naturally, it is beneficial for them to be retained until they are ready to do so. Premature extraction can lead to overcrowding of permanent teeth. Parents of younger children (5- and 8-year-olds) were asked what they would prefer for a decayed baby tooth. For parents of both these age groups, a higher proportion said they would prefer the tooth to be extracted. Around a quarter of parents of both age groups said they would have the tooth filled and similar proportions said they would prefer to leave the tooth alone. For 5-year-olds, 28% of parents preferred a filling, 40% an extraction and

31% would leave the tooth alone. There is little variation between social classes for treatment preferences for baby teeth.

Table 17

Periodontal health and dental behaviour

The relationship between children's periodontal condition and their tooth brushing behaviour is shown in Table 18. Generally, more frequent brushing was associated with less plaque and gingivitis, except for 8-year-old children. For example, 66% of 12-year-olds who brushed twice daily had gingivitis, compared with 72% who brushed only once. Forty-six per cent of 5-year-olds who brushed twice daily had plaque 57% of those brushing only once a day.

Table 18

Table 17 Proportion of parents preferring different treatment options for baby tooth by age (5 and 8) and social class (United Kingdom, 2003)

Age	5				8			
	I,II,III non-manual	III manual	IV,V	All	I,II,III non-manual	III manual	IV,V	All
	Percentage of children:							
Filled	28	30	24	28	31	28	29	29
Taken out	38	39	46	40	36	46	36	39
Left alone	33	30	24	31	28	22	34	27
Child has no baby teeth	*	1	5	1	5	4	1	5
<i>Weighted base</i>	<i>517</i>	<i>169</i>	<i>127</i>	<i>900</i>	<i>480</i>	<i>184</i>	<i>140</i>	<i>893</i>

Table 19 shows that among 15-year-olds, those who brush more frequently are less likely to have gingivitis. Thus over half (56%) of those who brush only once a day have gingivitis compared with 40% of those who brush more frequently. Less 15-year-olds (39%) who visit the dentist regularly have gingivitis, compared with those who only go when they have trouble (46%)

Table 19

Peridontal condition, hygiene behaviour and attitudes to oral health

Table 18 Relationship between reported frequency of teeth brushing and periodontal condition (United Kingdom, 2003)

		Frequency of brushing		
		Three times or more daily	Twice daily	Once daily or less
		Percentage of children:		
5-year-olds	Gingivitis	[23]	31	37
	Plaque	[35]	46	57
	Calculus	-	6	6
8-year-olds	Gingivitis	[79]	34	30
	Plaque	[92]	77	85
	Calculus	[4]	24	32
12-year-olds	Gingivitis	[45]	66	72
	Plaque	[60]	71	86
	Calculus	[21]	29	29
15-year-olds	Gingivitis	[46]	52	55
	Plaque	[64]	63	78
	Calculus	[32]	39	50

[] Caution low base number of respondents: figures are indicative only.

Table 19 Proportion of 15-year-old children with gingivitis by reported brushing frequency and dental attendance (United Kingdom, 2003)

	Frequency of brushing			Dental attendance			
	3 times or more daily	Twice daily	Once daily or less	Regular attendance	Occasional attendance	Only when trouble	Don't know
Percentage of 15-year-olds with:							
Gingivitis	40	39	56	39	44	46	49
<i>Weighted base</i>	50	470	118	376	84	141	39

Among 5-year-olds, the presence of a parent to help with brushing is associated with improved gingival health. Twenty-nine per cent of children who had an adult's help with brushing had gingivitis compared with 35% of those who brushed alone. Over half of 5-year-olds who brushed their own teeth had some plaque present compared with 44% of those who had help.

Table 20

Table 20 Proportion of 5-year-olds with unhealthy gums, plaque and calculus by who brushed teeth (United Kingdom, 2003)

	Who brushes teeth	
	Child	Adult or adult and child together
	Percentage of children with:	
Gingivitis	35	29
Plaque	52	44
Calculus	6	6
<i>Weighted base</i>	<i>487</i>	<i>491</i>

Appendix A The accuracy of survey results

Sources of error

Like all estimates based on samples, the results of the 2003 Children's Dental Health Survey are subject to variations and errors. The total error associated with any survey estimate is the difference between the estimate derived from the data collected and the true value for the population. The total error can be divided into two main types: random error and systematic error.

Random error

Random error occurs because survey estimates are based not on the whole population but only on a sample of it. There may be chance variations between such a sample and the whole population. If a number of repeats of the same survey were carried out, this error could be expected to average to zero. The size of the sample and the sample design influence the magnitude of these variations due to sampling.

Systematic error

Systematic error is often referred to as bias. Bias can arise because the sampling frame is incomplete, because of variation in the way the dental examination was carried out, or because non-respondents to the survey have different characteristics to respondents. When designing this survey considerable effort was made to minimise systematic error; this included training dental examiners and nurses to reduce variability between them. Nonetheless, some systematic error is likely to have remained, particularly from potential non-response bias, and the data were weighted to reduce any potential non-response bias.

Standard errors and design factors

Statistical theory enables estimates to be made of how close the survey results are to the true population values for each characteristic. A statistical measure of the variation, the standard error, can be estimated from the value obtained for the sample, and provides a measure of the statistical precision of the survey estimate. This allows for a confidence interval to be calculated around the sample estimate which gives an indication of the range in which the true population value is likely to fall. The confidence interval generally used in survey research is the 95% confidence interval; it comprises of approximately two (1.96) standard errors associated with the sample design; they cannot take account of potential errors such as non-response bias or random error due to the misunderstanding of questions.

For results based on simple random samples, without clustering or stratification, the estimation of standard errors is straightforward. However, the sample design of the Children's Dental Health Survey was not a simple random sample and therefore a more complex design calculation is needed which takes account of the stratification and clustering of the sample design is necessary. Stratification tends to reduce the standard error, while clustering tends to increase it.

In a complex sample design, the size of the standard error depends on how the characteristic of interest is spread within and between the primary sampling units, and this is reflected in the way the data are grouped in order to calculate the standard error.

Tables A1 to A4 show the standard error and 95% confidence intervals for survey estimates (calculated using STATA, a statistical analysis software package). The tables do not cover all the topics discussed in the report but show a selection of estimates based on information from both the questionnaire and the dental examination. The tables also show the design factor, or *deft*; the ratio of the complex standard error to the standard error that would have resulted had the survey design been a simple random sample of the same size. This is often used to give a broad indication of the degree of clustering. The size of the design factor varies between survey variables reflecting the degree to which a characteristic is clustered within PSUs, or is distributed between strata. For a single variable the size of the factor also varies according to the size of the subgroup on which the estimate is based, and on the distribution of the subgroup between PSUs and strata. Design factors below 1.0 show that the complex sample design improved on the estimate that would have been expected from a simple random sample, probably due to the benefits of stratification; design factors gained from a simple random sample, due to the effects of clustering.

Table A1 Standard errors and 95% confidence intervals for proportion of children with unhealthy gums (United Kingdom, 2003)

		Percentage (p)	Unweighted sample size	Standard error of p	95% confidence intervals	Deft
Boys						
	5-year-olds	33	1,440	4.1	24–41	3.3
	8-year-olds	65	1,447	3.0	59–71	2.4
	12-year-olds	68	1,379	3.1	62–74	2.5
	15-year-olds	56	1,097	2.2	52–60	2.2
Girls						
	5-year-olds	31	1,414	3.4	24–38	2.8
	8-year-olds	62	1,342	2.9	56–68	2.2
	12-year-olds	63	1,216	3.5	56–70	2.5
	15-year-olds	48	1,045	2.3	43–53	2.4
All children						
	5-year-olds	32	2,854	3.6	25–39	4.1
	8-year-olds	63	2,790	2.6	58–68	2.9
	12-year-olds	65	2,595	3.0	59–71	3.2
	15-year-olds	52	2,142	2.9	46–58	2.6

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Table A2 Standard errors and 95% confidence intervals for proportion of children with plaque (United Kingdom, 2003)

	Percentage (p)	Unweighted sample size	Standard error of p	95% confidence intervals	Deft
Boys					
5-year-olds	52	1,440	3.8	45–59	2.9
8-year-olds	78	1,447	2.6	73–83	2.4
12-year-olds	76	1,379	2.0	72–80	2.5
15-year-olds	68	1,097	3.3	62–74	2.6
Girls					
5-year-olds	48	1,414	3.8	41–55	2.8
8-year-olds	75	1,342	2.6	70–80	2.2
12-year-olds	70	1,216	1.9	66–74	2.6
15-year-olds	57	1,045	3.0	51–63	2.1
All children					
5-year-olds	50	2,854	3.6	43–57	3.9
8-year-olds	76	2,790	2.3	71–81	2.8
12-year-olds	73	2,595	2.5	68–78	2.9
15-year-olds	63	2,142	3.2	57–69	3.1

Table A3 Standard errors and 95% confidence intervals for proportion of children with calculus (United Kingdom, 2003)

	Percentage (p)	Unweighted sample size	Standard error of p	95% confidence intervals	Deft
Boys					
5-year-olds	6	1,440	1.0	4–8	1.5
8-year-olds	26	1,447	2.1	22–30	1.9
12-year-olds	32	1,379	2.2	28–36	1.8
15-year-olds	41	1,097	3.4	34–48	2.3
Girls					
5-year-olds	6	1,414	1.0	4–8	1.6
8-year-olds	21	1,342	1.6	18–24	1.5
12-year-olds	28	1,216	2.8	23–33	2.2
15-year-olds	37	1,045	3.1	31–43	2.1
All children					
5-year-olds	6	2,854	0.7	5–7	1.7
8-year-olds	23	2,790	1.6	20–26	2.0
12-year-olds	30	2,595	2.2	26–34	2.5
15-year-olds	39	2,142	3.0	33–45	2.9

Table A4 Standard errors and 95% confidence intervals for proportion of 15-year-olds with gingivitis (United Kingdom, 2003)

	Percentage (p)	Unweighted sample size	Standard error of p	95% confidence intervals	Deft
Boys	39	1,097	2.8	34–44	2.3
Girls	46	1,045	3.0	40–52	3.0